

TAXONOMIC AND NOMENCLATURAL NOTES ON
ZANTHOXYLUM AND GLYCOSMIS (RUTACEAE) ¹

GEORGE K. BRIZICKY

IN THE COURSE of surveying the genera of Rutaceae in the southeastern United States (see Jour. Arnold Arb. 43: 1-22. 1962), the author encountered several nomenclatural and taxonomic problems in *Zanthoxylum* L. and *Glycosmis* Corr ea which require further comment. These include the generic limits of *Zanthoxylum*; the legitimacy of the name *Z. coriaceum* A. Rich., in view of the existence of a supposedly earlier homonym; and the correct name of the type species of *Glycosmis*. The problem of *Z. coriaceum* has led to further bibliographic research on the dates of publication of Achille Richard's work on the flora of Cuba in Ram n de la Sagra's *Histoire Physique, Politique et Naturelle de l' le de Cuba*. These items are dealt with separately below.

THE GENERIC LIMITS OF ZANTHOXYLUM

The nomenclatural confusion concerning *Zanthoxylum* L. and *Fagara* L. seems to have been cleared up by the typification of the former by *Z. fraxineum* Willd. (= *Z. americanum* Mill.) by Fosberg (1959). (It is notable in this connection that Jussieu (1825, p. 505) and Triana and Planchon (1872, p. 310) indicated *Z. fraxineum* Willd. as the type of *Zanthoxylum* L. ("Zanthoxylum Colden — L. J. — Schreb.") .) As the matter stands at present, the name *Zanthoxylum* L. has to be applied either *sensu stricto* to the genus with one perianth whorl (a simple or haplochlamydeous perianth, according to Engler, or one composed of petals, according to Eichler), or *sensu lato* to the combined genus, including *Fagara* L. (type, *F. Pterota* L.) with two perianth whorls (a double or diplo- and heterochlamydeous perianth). The recognition of two separate genera or of a single inclusive genus remains a matter of personal evaluation of the evidence. For the students of tropical African, South American, and West Indian floras the generic status of *Fagara* apparently does not seem questionable, since no species of *Zanthoxylum* L. *sensu stricto* have been recorded from these regions. But students of the floras of eastern and southeastern Asia and North and Central America, where species of both these taxa occur, face the problem of the recognition

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of *Fagara* as a segregate genus. Opinions have differed. Thus, Rehder (1945, p. 73) in his study of Asiatic species of *Zanthoxylum* and *Fagara* came to the conclusion that "the two genera are close and none of the characters are strong enough for generic separation, so it seems preferable to consider them subgenera or sections of one genus, as done by most authors." A different view is represented by Reeder and Cheo (1951, p. 68) who say, "After studying numerous specimens in this complex, it is our feeling that both these genera are worthy of recognition. Although there are no striking vegetative differences, flowering specimens are quite distinct. Accordingly we are accepting both *Xanthoxylum* and *Fagara*, an interpretation which is, we believe, in harmony with that of most modern students of the group."

Such disagreement in regard to the generic status of *Fagara* is based on differences in views as to the morphological nature of the perianth in *Zanthoxylum*. The earliest view, that formulated by Linnaeus in his generic descriptions, that the flowers of *Zanthoxylum* are apetalous while those of *Fagara* have sepals and petals, was followed by all taxonomists up to 1878 (e.g., Humboldt, Bonpland & Kunth, 1823; De Candolle, 1824; Jussieu, 1825; Triana & Planchon, 1872; Engler, 1874). This interpretation of the perianth favored considering *Fagara* a subgenus of *Zanthoxylum*, as was done by Triana and Planchon (1872), as well as by Engler (1874). Although maintaining the Linnaean view on the perianth of *Zanthoxylum*, Jussieu (1825, p. 505) noted, "Sepala interdum plura, sex aut etiam (teste Kunth) novem. Quorum analogia cum petalis confirmatur situ alterno staminibus ovariisque opposito, praetereaue metamorphosi ipsorum in stamina non infrequenti (observante C. Richard)." These features of the flowers spoke against the Linnaean interpretation of the perianth leaves of *Zanthoxylum* as homologous with the sepals, but Jussieu's note was disregarded or overlooked by his contemporaries.

In 1878, Eichler (p. 323), like Jussieu, taking into consideration the alternate position of the stamens and the opposite position of carpels (in the case of isomery) in respect to the perianth parts (leaves) in *Zanthoxylum americanum* ("*Z. fraxineum*"), concluded that the perianth leaves in this species are homologous with the petals and the flowers are asepalous. Eichler's view, accepted and followed by most American taxonomists, also was in favor of the inclusion of *Fagara* in *Zanthoxylum* as a subgenus or section of the latter.

Engler (1896, 1931), however, after reconsideration of his previous (Linnaean) view, came to the conclusion that the perianth of *Zanthoxylum* is simple (haplochlamydeous), not homologous with the sepals, of a primitive type which occurs in Rutaceae only in this genus, and that it cannot be derived from the double (diplo- and heterochlamydeous) perianth of *Fagara*. Consequently, *Zanthoxylum* and *Fagara* should be recognized as distinct genera. This view has been adopted by many taxonomists, especially in Europe. Engler's interpretation of the perianth in *Zanthoxylum* is objectionable on at least two bases.

First, there is no evidence that the simple perianth of *Zanthoxylum*

really represents a primitive condition which is not the result of simplification. On the contrary, Saunders (1934, p. 660, *figs.* 37–39, & p. 661), analyzing the carpellate flowers of *Z. planispinum* Sieb. & Zucc. (= *Z. alatum* Roxb. var. *planispinum* Rehd. & Wilson), treated its eight-merous perianth as consisting of four sepals and four petals. She also noted that “exsertion of the two median sepals is delayed until after that of petals.” The latter observation, if confirmed by more abundant material, may also suggest some complexity in ontogenetic development of the perianth expressed in delay, or perhaps discontinuation of development, of some or all of the sepals (or their homologues). In his considerations of phylogeny of the Rutaceae, based on Saunder’s floral anatomical data, Moore (1936, p. 321) stated that his type “A” of vascularization of the floral parts (including *Zanthoxylum fraxineum* Willd., and apparently *Z. planispinum* Sieb. & Zucc., the species studied in greater detail by Saunders) “is more than likely the result of reduction.”

Second, the occurrence in Mexico and Central America (perhaps also in South America) of species of *Zanthoxylum* which appear to be transitional to *Fagara* in their perianth structure supports Eichler’s interpretation of the perianth in *Zanthoxylum*, rather than that of Engler. Thus, the perianth of carpellate flowers of *Z. ferrugineum* Radlk. (*Donnell Smith 6468*) from Costa Rica is described by Radlkofer (in Smith, 1897, p. 392) as, “perianthii foliola 9–10, linearia (2–3 mm. longa), alia (plus minus conspicue exteriora et sepalis respondentia) breviora et angustiora, alia (sub-interiora, reliquiis subalterna) longiora et paullulo latiora, omnia tenuiter membranacea.” The staminate flowers of *Hinton et al. 10136* (GH) from Mexico (identified at Kew as *Z. ferrugineum* Radlk., but perhaps representing a different species closely allied with the latter) possess five to ten, often eight to nine, perianth leaves, all similar in appearance, with one to five \pm exterior and smaller than the others. The four to five stamens usually are opposite the smaller and alternate with the larger perianth leaves. (One five-merous flower which the author examined corresponded exactly with the *Fagara* type with only the difference that the minute sepals were of the same appearance as the petals.) Almost similar conditions were found in staminate flowers of *Z. mazatlanum* Sandw. (isotype, *Gonzales Ortega 5210*, GH), from Mexico, with 4–11-merous perianth and four to six stamens, and *Z. Williamsii* Standl. (isotype, *A. Molina 1078*, GH), from Honduras, with four to eight perianth leaves and usually four stamens. A few carpellate flowers (fruits) of *Z. Williamsii* exhibited six or seven persistent perianth leaves. It is also notable that Engler (1874, p. 180), having described *Zanthoxylum ciliatum* as a new species from Venezuela, remarked, “Species valde insignis et cum nulla alia Austro-Americana adhuc descripta confundenda. . . . Characteribus suis transitum inter *Zanthoxylum* et *Fagara* efformat.” The present author’s conclusion from the above is that the “simple” perianth of *Zanthoxylum* is most likely a secondary condition, derived by reduction from that of the *Fagara* type by abortion of some or all the sepals. The occurrence of species of *Zanthoxylum* which appear in their perianth structure to

be transitional to *Fagara* not only supports this view, but also is ample reason to regard *Fagara* as a subgenus of *Zanthoxylum*.

ZANTHOXYLUM AMERICANUM MILL. VERSUS ZANTHOXYLUM FRAXINEUM WILLD.

Fosberg (1958, 1959), when discussing the problem of typification of *Zanthoxylum*, introduced an element of confusion into the nomenclature of the type species through the suggested replacement of *Z. americanum* Mill. (1768) by its later synonym, *Z. fraxineum* Willd. (1796). He reasoned, "Furthermore, according to Miller's description, his *X. americanum* could not be what is now called that as he says of it 'the flowers grow in loose panicles as on the first sort' rather than in axillary fascicles which is the case with the modern *Z. americanum* Mill. Lawrence, when photographing Miller's types in the British Museum in 1950, was unable to locate a specimen of *Xanthoxylum americanum* so we have no way of knowing what plant this name actually refers to. . . . As pointed out in *Taxon* 7(4): 95, 1958, the earliest available name for this is *Zanthoxylum fraxineum* Willd. (1805)." A number of items argue against Fosberg's proposition, however.

The general description of *Xanthoxylum americanum* given by Miller and his mentioning both the natural occurrence of the species in Pennsylvania and Maryland and its resistance to cold seem to show clearly that Miller's name referred to the plant of the northeastern United States, i.e., to the only species of *Zanthoxylum* which occurs north of Virginia and Arkansas. Furthermore, Aiton (1813, pp. 382, 383) mentioned only three species of *Zanthoxylum* which were introduced and cultivated by Miller in the Botanic Gardens at Kew. These were "*Z. emarginatum* Willden. . . . Cult. before 1739, by Mr. Philip Miller. Mill. dict. vol. 2 addenda, *Lauro affinis* 2."; "*Z. Clava Herculis* Willden. . . . Cult. 1739, by Mr. Philip Miller"; and "*Z. fraxineum* Willden. . . . Cult. before 1759, by Mr. Philip Miller. Mill. dict. ed. 7. n. 2." The last quotation indicates that the plant grown at Kew as *Z. fraxineum* Willd. was that introduced by Miller and described by him in the seventh edition (1759) of his *Gardeners Dictionary* as "*Xanthoxylum* no. 2." Since the latter, in turn, was the same entity as *Xanthoxylum americanum* of the eighth edition (1768) of Miller's work (the corresponding descriptions in both editions are identical), the conspecificity of the latter species with *Z. fraxineum* Willd. appears to be unquestionable. The circumstance that the type specimen of *X. americanum* has not been found among Miller's types but that the species was introduced into the Botanic Gardens at Kew prior to the appearance of the seventh edition of *Gardeners Dictionary* makes it probable that the description of this species was made from the living plant.

In 1771, Du Roi (pp. 57, 58) mentioned the species as *Xanthoxylum americanum* Mill., and provided it with a rather detailed Latin diagnosis, including the correct description of the inflorescence and staminate flowers

(which he erroneously took for bisexual). He, however, regarded *X. americanum* as a variety of *Zanthoxylum Clava-Herculis* saying, "Cl. Millero species, mihi varietas *Zanthoxyli Clavae Herculis* L." In 1772, Du Roi (pp. 511, 512) again treated Miller's species in the same way, but the description was given in German. Wengenheim (1787, p. 116) treated *Xanthoxylum americanum* as a species, noting that perhaps it should be considered a variety of *Z. Clava-Herculis* L. Neither Du Roi nor Wengenheim had any doubts regarding the entity named and described by Miller.

Willdenow, in describing *Zanthoxylum fraxineum* (1796, p. 413), apparently was aware that his new species was identical with that of Miller, since he mentioned "*Zanthoxylum Clava Herculis* Du Roi" and "*Zanthoxylum americanum* Wangh." in the synonymy and also noted that "Der Herr von Wengenheim und Miller geben dieser Art ungezähnte Blättchen." Schkuhr (1803, pp. 467, 468, pls. 323, 323b), although he called the species *Z. fraxineum* Willd., remarked (p. 466) that this was the species which "auch Miller, Wengenheim und andere schon unter *Zanthoxylum americanum* bemerkt haben."

Since the entity described by Miller as *Xanthoxylum americanum* is known, neither the occurrence of an error in the description nor the lack of a type specimen makes this binomial illegitimate. Therefore, its replacement by *Z. fraxineum* Willd., as suggested by Fosberg, appears unjustifiable in the light of the present Code of Botanical Nomenclature.

ZANTHOXYLUM CORIACEUM A. RICHARD AND ITS DATE OF PUBLICATION

The legitimacy of *Zanthoxylum coriaceum* A. Richard in Ramón de la Sagra (Hist. Phys. Polit. Hist. Nat. Cuba. Bot.-Pl. Vasc. [Essai Fl. Cuba 1.] 326. pl. 34) is often questioned because of the existence of a supposedly earlier homonym, *Z. coriaceum* (Desv.) Walpers, Repert. 1: 521. 1842 ("*coriacea*"). The former name refers to the species of southern Florida and the West Indies (absent from Jamaica and a few other islands); the latter is a synonym of the Jamaican *Z. spinosum* (L.) Sw. According to Urban (1894, p. 563) and Kuntze (1898, p. 162) the French edition of the Richard work appeared in 1845 and preceded the Spanish edition which bears the same year of publication. The publication date of the portion of this work that included *Z. coriaceum* A. Rich. was presumed by Wilson (1911, p. 185) to be 1842 and by Little (1953, p. 437) to be 1842 or 1843. Finally, Van Steenis-Kruseman (1960, p. 741), with reference to data given by Grisebach (1841, 1842, 1847, 1852) in connection with this work, stated, "Up to and including 1840, 28 parts were issued; in 1841 11 others followed. At that time the 1st part of the cellular cryptogams was out and the phanerogams were published up to the end of the Thalamiflorae (Cand. Syst.). In 1846 parts 1-54 had been published, probably no other parts appeared. The atlas, dated 1845 too, was not finished before 1851 (cf. Wiegmann's Repert. l.c. 1852, 387)." This statement, however, is not entirely clear and needs further explanation.

The Richard work consists of 42 signatures (printed sheets or *Bogen*) of 16 pages each, except the last with only 7 printed pages. Similarly, Montagne's *Plantes Cellulaires*, of the De la Sagra work, contained 35 such signatures, the last one of 15 pages. Usually several signatures formed an installment (a fascicle or an issue, *Lieferung, livraison*). It is unknown whether Grisebach's "Lieferungen" translated as "parts" by Van Steenis-Kruseman should be understood as installments (improbable because of their high number, e.g., 53 by 1846) or referred to the printed signatures (*Bogen*).

Richard's work was most likely published irregularly in relatively few, perhaps unequal, installments consisting of at least several signatures. Thus, a notice in Hooker's *London Journal of Botany* (1: 308–311), issued in June or July, 1842, mentioned receipt of "several of the first numbers" of the Richard work, accompanied with plates. At approximately the same time, Walpers apparently had at his disposal 192 pages (12 signatures) of this work, including Ranunculaceae through Buttneriaceae, since he included in the first volume of his *Repertorium* (1842) new taxa of this group of families (the last species mentioned being *Guzuma parvifolia*). Pages 193–336 (signatures 13–21) became available to Walpers sometime later in 1842 or 1843, since Richard's new taxa of Tiliaceae (e.g., *Belotia*) through Rutaceae (e.g., *Zanthoxylum coriaceum*) appeared in Supplementum 1 which was included in the second volume of the *Repertorium* (1843–1844). Endlicher, however, apparently had at his disposal both these portions in 1842, since Richard's new genera, including *Belotia*, were mentioned in the Addenda to the 2nd Supplementum to the *Genera Plantarum* (1842, after March). Grisebach (1842), recording the publication of Richard's work during 1841, mentioned Simaroubaceae as the last family treated by Richard in that portion. Therefore, one should assume that the part of Richard's work which appeared in 1841 consisted of pages 1–336 (signatures 1–21), and probably *Plates 1–35*, and included the families Ranunculaceae to Simarubeae (as well as one page of Ochnaceae with a portion of the generic description of *Gomphia*).

According to Grisebach's report of 1847, the part of Richard's work published during 1846 included the families Ochnaceae to "Portulaccae" up to page 624. Although it is unknown whether the corresponding *Plates 36–44(2)* also appeared at that time, there is no ground (at least at present) for the belief that the appearance of these plates was delayed. A relatively long interval between publication of this and the first part of the work is also evident from the Richard "Avant-propos" (p. vii) which is dated February 1, 1845. "Les circonstances tout à fait indépendantes de notre volonté ont singulièrement retardé la publication de la deuxième moitié de ce volume. Nous espérons que désormais cet ouvrage marchera avec plus de régularité vers la fin de sa publication." It is unknown whether this second part of Richard's work was issued in installments or whether it remained undistributed until the completion of the whole volume. One may assume that this part was either rare or not available at all to botanists for at least a few years after its publication.

Thus, Planchon (1846–1847) did not mention Richard's new species of *Gomphia* in his review of the genera and species of Ochnaceae; Naudin (1849–1852) did not include either *Pachyanthus* A. Rich. or *Naudinia* A. Rich., which was named after him, in the monograph of Melastomataceae; and only one new genus (*Belairia*, Leguminosae) of the second part of Richard's work was mentioned in the third edition of Lindley's *The Vegetable Kingdom* (1853).

Finally, in Grisebach's report of 1852 on phytogeographical and taxonomic works which were published during the preceding year, we read (p. 375), "Von R. de la Sagra's Werk über Cuba wurde der erste Band der von Richard bearbeiteten Gefässpflanzen (s. Jahresb. f. 1846. p. 53) vollendet¹⁴¹). Übersicht der seitdem bearbeiteten Familien: 5 Phytolaccen, 3 Cacteen, 4 Umbelliferen, 1 Araliaceae, 1 Hedera, 4 Loranthaceen" and (p. 387) "141) R. de la Sagra, Histoire physique, politique et naturelle de l'île de Cuba. Botanique. Plantes vasculaires, par A. Richard. al. tit. Essai d'une flore de l'île de Cuba. T. I. contenant les Dicotylédones polypétales. 663 pag. 8. Atlas. Paris 1845. (aber jetzt vollendet)." It is evident that the last parenthetical phrase referred to both the text and the atlas, not to the atlas alone. The circumstance that no new taxa of Phytolaccaceae (*Trichostigma* A. Rich., p. 627; *T. rivinoides*, p. 628; *Stegnosperma cubense*, p. 632), proposed by Richard in this last part, were mentioned by Moquin (1849) in his monograph of Phytolaccaceae (including "Addenda et Corrigenda"), seems to support the last Grisebach statement.

In summary, I assume the following probable dates of publication for Richard's work:

- 1841: Part 1 (in a few installments?), pp. 1–336 (signatures 1–21), probably *pls.* 1–35, Ranunculaceae to Simarubeae.
 1846: Part 2 (in installments?), pp. 337–624 (signatures 22–39), probably *pls.* 36–44(2), Ochnaceae to Portulacaceae.
 1851: Part 3, pp. 625–663 (signatures 40–42) and i–viii, probably *pl.* 44(3), Phytolaccaceae to Loranthaceae.

Since 1841 may be accepted as the publication date for *Zanthoxylum coriaceum* A. Rich., the priority of this binomial over *Zanthoxylum coriaceum* (Desv.) Walpers (1842) is clear and the former is the correct name for the species of southern Florida and the West Indies.

THE TYPE SPECIES OF GLYCOSMIS

Much nomenclatural confusion, with resulting taxonomic discrepancies, surrounds *Limonia arborea* Roxb. (1798), the type species of *Glycosmis* Corrêa. Tanaka considered this species to be identical with *Limonia pentaphylla* Retzius (1788) and applied to it the binomial *Glycosmis pentaphylla* (Retz.) Corrêa. Narayanaswami (1941), however, came to the conclusion that *Limonia arborea* Roxb. and *Limonia pentaphylla* Retzius are entirely different species, *Glycosmis arborea* (Roxb.) Corrêa and

G. pentaphylla (Retz.) Corr ea, respectively. A brief history of the genus and the basic species involved is necessary for an understanding of the situation.

In 1788, Retzius (p. 24) proposed *Limonia pentaphylla* based on Koenig's specimen from the East Indies. The leaves of this species were described as "Folia plerumque in petiolo quina, alterna, ovata, acuta, integra, magnitudine foliorum *Citri Medicae*." Roxburgh (1798, p. 60, *pl.* 84) provided the plant which he believed to be *Limonia pentaphylla* Retzius with a more or less detailed description and drawings, and also described and illustrated a new species, *Limonia arborea* (p. 60, *pl.* 85). According to him, the former species possessed relatively small, entire leaflets and staminal filaments conspicuously dilated upwards, while the leaflets of the latter species were larger than in the preceding and toothed, the staminal filaments \pm filiform. However, Tanaka (1928a, p. 159) pointed out that "Roxburgh unfortunately transposed the figures [of the flowers] in the two drawings given in his above mentioned book."

In 1805, Corr ea founded the genus *Glycosmis*, basing it on *Limonia arborea* and *L. pentaphylla* as they were understood by Roxburgh. Corr ea, however, did not make formal transfers of these species into his genus, but only remarked (1805, p. 386), "Le *Limonia arborea* et le *Limonia pentaphylla* de Roxburgh, *pl.* Coromand. vol. 1, fig. 85, 86 [sic] . . . m'ont furni le caract re du genre *Glycosmis*, qui se distingue ais ment du reste de la famille." De Candolle (1824, p. 538) apparently was the first to make the formal transfer. *Glycosmis arborea* (Roxb.) DC. was based on *Limonia arborea* Roxb., and *Glycosmis pentaphylla* DC. was based on the plant identified and illustrated by Roxburgh as "*Limonia pentaphylla* Retzius" and only questionably on Retzius' species ("*G. pentaphylla*, . . . *Limonia pentaphylla* Retz. obs. 5. p. 24 ? Roxb. cor. 1. t. 84.")² Most taxonomists, however, subsequently used the binomial *Glycosmis pentaphylla* (Retz.) Corr ea for this species.

Engler (1896, p. 185) introduced a new combination, *Glycosmis cochinchinensis* (Lour.) Pierre ex Engler, based on Loureiro's *Toluiifera cochinchinensis* (1790) and including *G. pentaphylla* (Retz.) Corr ea taken in a very broad sense. It is unknown for what reason Engler ascribed the authorship of this new combination to Pierre. As far as the present author has been able to determine, Pierre himself did not make the transfer of *Toluiifera cochinchinensis* into *Glycosmis*. In 1893 (text to *pl.* 285), having described a new species, *G. montana*, from Cochinchina, he mentioned "le *Glycosmis pentaphylla* Corr. qui est la m me chose que le *Toluiifera cochinchinensis* (Lour. Fl. Coch., p. 262) ou *cam ruu* des Annamites. . ." From a brief description of *G. pentaphylla*, included in the note, it is clear that Pierre understood this species in a broad sense.

Tanaka, who studied extensively *Glycosmis* (as well as the other genera

² Further evidence that *G. pentaphylla* DC. was indeed based on the nonexistent basionym *Limonia pentaphylla* Roxb. is found in the way in which De Candolle (1824, p. 538) cited the basionym of his *Clausena pentaphylla*, "*Limonia pentaphylla* herb. Lamb. non Roxb."

of Aurantioideae), visited European herbaria in the late 1920's in a search for generic types. In 1928, he reported finding, in the Lund Herbarium, a Koenig specimen which presumably was the authentic type specimen of *Limonia pentaphylla* Retzius.³ An examination of this specimen showed that the true *Limonia pentaphylla* Retz. was conspecific with *L. arborea* Roxb. and different from the plant identified by Roxburgh as *L. pentaphylla*. Consequently, Tanaka reduced *G. arborea* (Roxb.) Corr ea (= *G. arborea* (Roxb.) DC.) to the synonymy of *G. pentaphylla* (Retz.) Corr ea. To Roxburgh's "*Limonia pentaphylla* Retz." Tanaka (1928b) applied another name, *Glycosmis mauritiana* (Lam.) Tanaka, based on *Limonia mauritiana* Lam. (1792). Narayanaswami (1941), apparently having overlooked Tanaka's article on the type of Retzius' species, came to the conclusion, based only on Retzius' description of *Limonia pentaphylla* which mentions the entire leaflets, that Tanaka's interpretation of *L. pentaphylla* was entirely incorrect and that *L. pentaphylla* Retz. and *L. arborea* Roxb. are different species.

Narayanaswami was also of the opinion that Corr ea should be assigned the authorship of the combination *Glycosmis pentaphylla*, as well as that of *G. arborea*. "But when we take into consideration the facts regarding the origin of the genus *Glycosmis* and the species *G. pentaphylla* and their acceptance by all botanists up to this day, as having been created by Correa, it logically follows that Correa should be assigned the authorship of *G. arborea* also, since *Limonia arborea* Roxb. formed one of the components of the types of the genus *Glycosmis* of Correa. There appears to be no rule in the botanical nomenclature, that governs such cases where an author creates a new genus from two species of another genus, and leaves it without making the necessary transfer of the earlier species to the new genus. But when a subsequent worker assigns the two species in their new status to the author of the new genus, does it not become binding on all subsequent botanists to follow this adoption by the first botanist, subsequent to the publication of the genus" (Narayanaswami, 1941, p. 25). Narayanaswami was correct insofar as there apparently was no clear rule governing the transfers at that time. However, in 1952 at Paris, the Eighth Botanical Congress formulated a rule concerning validly published new combinations and illustrated it with very clear examples (Art. 32, Int. Code Bot. Nomencl. 1954). In the light of this rule, Corr ea's mentioning "*Le Limonia arborea* et le *Limonia pentaphylla* de Roxburgh"

³In 1932, Fischer reported on an examination of the Koenig collection of the Lund Herbarium, which was sent on loan to Kew. Interestingly, *Limonia pentaphylla* Retzius was listed neither among the 346 "Retzius specimens" examined nor among 33 species mentioned in Retzius' *Observationes* but not found in the Koenig collection. Nor was "the authentic Retzius' specimen of *Citrus decumanus*," quoted by Tanaka (1928a) included in either of the two lists. The presence, however, in the Koenig collection of a number of other specimens which were recognized as authentic Retzius specimens by Tanaka (*Triphasia trifolia* (Burm. f.) P. Wils., *Pleiospermum alatum* (W. & A.) Swingle, and *Feronia limonia* (L.) Swingle ["*Limonia acidissima* L." of Retzius]) makes Tanaka's conclusion in regard to the authenticity of the specimen of *Limonia pentaphylla* Retz. very probable.

as the species on which the genus *Glycosmis* was based does not constitute publication of the new combinations in this genus. Therefore the use of Corr ea's authorship for these combinations is against the rules. De Candolle (1824) seems to be "the first botanist subsequent to the publication of the genus" who made formal transfer of the above-mentioned species of *Limonia* into *Glycosmis* as *G. pentaphylla* and *G. arborea*, and his authorship for these binomials is indisputable.

As was mentioned above, Tanaka (1928a), on the basis of the presumed type specimen of Retzius' species, stated that *Limonia pentaphylla* Retzius and *L. arborea* Roxb. were conspecific and different from the plant described and illustrated by Roxburgh as Retzius' species. Then *Glycosmis pentaphylla* DC., based on Roxburgh's plant, not on that of Retzius, must be regarded not as a new combination, but as a new name in *Glycosmis* for the species for which Tanaka later (1928b) created the combination *G. mauritiana* (Lam.) Tanaka (based on *Limonia mauritiana* Lamarck, validly published in 1792, not in 1789 as Tanaka believed). Since *G. pentaphylla* DC. cannot be applied to Retzius' *Limonia pentaphylla*, the next available name for the latter species is *Glycosmis arborea* (Roxb.) DC.

The third species involved in the nomenclatural confusion was *Glycosmis cochinchinensis* (Lour.) Pierre ex Engler (1896, p. 185) which was nomenclaturally based on *Toluijera cochinchinensis* Loureiro (1890, p. 262). Creation of this combination was of no assistance to our knowledge of the entity described by Loureiro as *Toluijera cochinchinensis*, for the type of the latter is not extant. Merrill has helped to reveal its identity. "Although Engler in taking up Pierre's transfer [sic!] of Loureiro's specific name intended it to replace *G. pentaphylla* Corr. as a collective species, it is not the same as *Limonia pentaphylla* Retz. (Obs. 5: 24. 1789) = *Glycosmis pentaphylla* Corr. Loureiro's species is represented by *Clemens* 3363, 4448, from thickets at Hue and Tourane [presumed classical localities for most of Loureiro's species from Cochinchina], and de Pirey's specimen of *cam ruou*, *Chevalier* 41186. Guillaumin's description of *Glycosmis cochinchinensis* (Lour.) Pierre applies only in small part to Loureiro's species as he treated it as a collective one, citing 14 synonyms, most of which have to be excluded with the restriction of specific limits to the form actually described by Loureiro. True *Glycosmis pentaphylla* (Retz.) Correa does not occur in Indo-China" (Merrill, 1935a, p. 221). Merrill commented further, "The Hainan specimens closely match *Chevalier* 41186, Anamese *com ruou* (Loureiro's *cay cam ruu*) from Anam, and I believe these to represent Loureiro's species. This form closely resembles *G. citrifolia* (Willd.) Lindl., but the leaves are constantly simple. *Chun* 5722 from Hainan, which represents the same form as the specimens cited above, has been identified by Tanaka as representing *Glycosmis citrifolia* (Willd.) Lindl. var. *obtusata* (Miq.) Tanaka" (Merrill, 1935b, p. 17). The quoted notes suggest that *Toluijera cochinchinensis* Lour. is closely related to *Glycosmis parviflora* (Sims) Little

(*G. citrifolia* (Willd.) Lindl.) and perhaps should be included in the latter.

In conclusion, it is to be said that in the light of the current rules of botanical nomenclature and of our present knowledge of botanical bibliography, the nomenclature of the two basic species of *Glycosmis* appears to be the following:

Glycosmis arborea (Roxb.) DC. Prodr. 1: 538. 1824.

Limonia arborea Roxb. Pl. Coromand. 1: 60. *pl.* 85. 1798.

Limonia pentaphylla Retz. Obs. Bot. 5: 24. 1788.⁴

Glycosmis pentaphylla sensu Tanaka and many other authors, not *G. pentaphylla* DC. 1824.

Glycosmis mauritiana (Lam.) Tanaka, Bull. Soc. Bot. Fr. 75: 708. 1928.

Limonia mauritiana Lam. Encycl. Méth. Bot. 3: 517. 1792.

Limonia pentaphylla Retz. according to Roxb. Pl. Coromand. 1: 60. *pl.* 84. 1798, not Retzius, 1788.

Glycosmis pentaphylla DC. Prodr. 1: 538. 1824; incorrectly given as *G. pentaphylla* (Retz.) Corréa by Narayanaswami, Rec. Bot. Surv. India 14(2): 12. 1941.

SUMMARY

With regard to the generic limits of *Zanthoxylum* L., especially in connection with the difference in perianth structure between *Zanthoxylum* L. *sensu stricto* and *Fagara* L., the "simple" perianth of the *Zanthoxylum* type is presumed to be a secondary condition derived by reduction from the double perianth of the *Fagara* type. The occurrence in Mexico and Central America (perhaps also in South America) of species of *Zanthoxylum* which appear to be transitional to *Fagara* in their perianth structure is considered ample reason to regard *Fagara* as a subgenus of *Zanthoxylum*, rather than as a distinct genus.

A number of lines of evidence show that Miller's binomial *Xanthoxylum americanum* (1768) referred to the northeastern American species which was later described by Willdenow (1796) as *Zanthoxylum fraxineum*. Since neither the occurrence of an error in Miller's description nor the

⁴Tanaka's interpretation of *Limonia pentaphylla* Retzius, based on the presumed type specimen, seems preferable to the Narayanaswami's concept of the species. This is especially true if one also takes into consideration that the original description of *Limonia pentaphylla* Retz. is well applicable to *L. arborea* Roxb., except for the entire leaflets of the former species and the serrate to crenate ones of the latter. It should be remembered, however, that the serration of leaflets in some specimens of *L. arborea* is perceptible only with a lens. On the other hand, the Retzius' species differs from "*Limonia pentaphylla* Retz." of Roxburgh in acute leaflets ("never acute" in the latter according to Narayanaswami, 1941, p. 14) and their size, "magnitudine foliorum *Citri Medicae*," ("small" according to Narayanaswami, loc. cit., "from two to three inches long, and about one and a half broad" according to Roxburgh 1798, p. 60). The leaves of *Citrus Medica* are about 12-20 cm. long.

lack of the type specimen makes Miller's binomial illegitimate, the replacement of *Zanthoxylum americanum* Mill. by *Z. fraxineum* Willd., recently suggested by Fosberg, seems to be unjustifiable in the light of the present code of botanical nomenclature.

In the light of the publication dates of Achille Richard's work on the flora of Cuba (in Ramón de la Sagra), as reported by Grisebach (1842, 1847, 1852), the priority of *Zanthoxylum coriaceum* A. Rich. (1841) over its homonym *Z. coriaceum* (Desv.) Walpers (1842) appears indisputable. Thus, the former binomial is the legitimate and correct name of a well-known species of southern Florida and the West Indies.

A very complex situation in the nomenclature of the type species of *Glycosmis* Corrêa, *Limonia arborea* Roxb. (1798), is shown, and a brief history of this genus and the basic species is given. Tanaka's assumption of the conspecificity of *Limonia pentaphylla* Retzius (1788) with *L. arborea* Roxb., based on the presumed authentic type specimen of the former, seems correct. Since *G. pentaphylla* DC., based on *Limonia pentaphylla* sensu Roxburgh (1798), not of Retzius (1788), cannot be applied to *Limonia pentaphylla* Retz., the next available name for the latter species is *G. arborea* (Roxb.) DC. The correct name for *G. pentaphylla* DC. is *G. mauritiana* (Lam.) Tanaka. The third species involved in the nomenclatural confusion was *G. cochinchinensis* (Lour.) Pierre ex Engler, which was based on *Toluijera cochinchinensis* Loureiro (1790). Merrill's notes on the latter species, quoted by the present author, suggest a close relationship of Loureiro's species with *G. parviflora* (Sims) Little (*G. citrifolia* (Willd.) Lindl.), rather than with *G. arborea*.

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